

SI Geology - Full Discipline Demo

Earthquakes

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Geology - Full Discipline Demo
Course	SI Geology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Categorize each statement as true or false.

⚡ An epicenter is the point within the Earth at which the earthquake originates.

⚡
Normal faults are characterized by gravity pulling down the hanging wall, causing it to slide down along the footwall.

⚡
Overall travel of P- and S-waves is the same, although the motion of these waves occurs at perpendicular angles.

⚡
Reverse faults are formed when compression compacts a block of rock, causing a shortening of the crust.

⚡
S-waves are compressional waves that change the volume of the rock they travel through.

⚡
Strike-slip faults occur when tension pulls two blocks of rock apart, causing a lengthening of the crust.

⚡
Water-saturated soils can undergo liquefaction, acting as a fluid due to loss of strength, during an earthquake.

True

False

1

2

Correct answers:

1

Normal faults are characterized by gravity pulling down the hanging wall, causing it to slide down along the footwall.

Overall travel of P- and S-waves is the same, although the motion of these waves occurs at perpendicular angles.

Reverse faults are formed when compression compacts a block of rock, causing a shortening of the crust.

Water-saturated soils can undergo liquefaction, acting as a fluid due to loss of strength, during an earthquake.

2

An epicenter is the point within the Earth at which the earthquake originates.

S-waves are compressional waves that change the volume of the rock they travel through.

Strike-slip faults occur when tension pulls two blocks of rock apart, causing a lengthening of the crust.

Place the steps used to locate an earthquake epicenter in order.

≡ Calculate the difference in arrival time between the P- and S-waves.

1 **Correct answer:** Determine the time of P-wave and S-wave arrival on the seismogram.

≡ Determine the time of P-wave and S-wave arrival on the seismogram.

2 **Correct answer:** Calculate the difference in arrival time between the P- and S-waves.

≡ Draw a circle with a radius equal to the distance from the station to locate potential earthquake locations.

3 **Correct answer:** Use the travel-time graph to determine the distance from the station to the epicenter based on the difference in times.

≡ Locate the point where the three circles cross to determine the earthquake epicenter.

4 **Correct answer:** Draw a circle with a radius equal to the distance from the station to locate potential earthquake locations.

≡ Repeat the process with data from at least two more seismograms.

5 **Correct answer:** Repeat the process with data from at least two more seismograms.

≡ Use the travel-time graph to determine the distance from the station to the epicenter based on the difference in times.

6 **Correct answer:** Locate the point where the three circles cross to determine the earthquake epicenter.

Exploration

The ____ is the point within the earth where an earthquake originates.

- ☐ epicenter
- ☒ focus
- ☐ site effect
- ☐ origin



A ____ fault occurs where two blocks of rock slide past one another.

- ☐ normal
- ☐ reverse
- ☐ strike-slip

✓

P-waves are longitudinal waves that push and pull at the rock, causing deformation in the direction that the wave propagates.

- ☐ True
- ☐ False

✓

When reading a seismogram, the first seismic wave to arrive at a location is the S-wave.

- ☐ True
- ☐ False

✓

Exercise 1

What is the latitude and longitude of your epicenter?

Based on your results, would it be any more beneficial to use more than three seismograph stations? Why or why not?

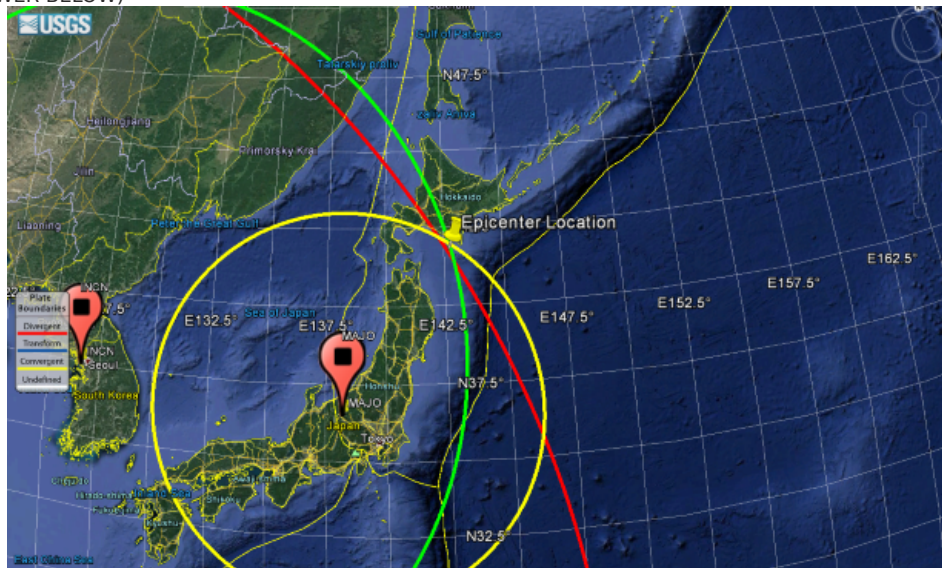
What type of plate boundary is located near the epicenter?

Do you see any relationships among earthquakes, volcanoes, and tsunamis? Explain your reasoning.

Data Table 1: Earthquake Triangulation via Three Seismograph Stations
(SAMPLE ANSWER BELOW)

	HKPS	INCN	MAJO
Latitude (DD)	22.28	37.48	36.55
Longitude (DD)	114.14	126.62	138.20
P-wave Arrival Time (UTC)	03:31:45	03:28:37	03:27:05
S-wave Arrival Time (UTC)	03:36:48	03:31:03	03:28:19
S-P Time Difference (UTC)	00:05:03	00:02:26	00:01:14
Distance from Epicenter (km)	3,439	1,464	719

Photo 1: Epicenter Location
(SAMPLE ANSWER BELOW)





Competency Review

___ faults are formed when tension pulls two blocks of rock apart, causing a lengthening of the crust.

- ☒ Normal ✓
- ☐ Reverse
- ☐ Strike-slip

S-waves can travel through solids, but not liquids or gases.

- ☒ True ✓
 - ☐ False
-

Data from how many stations was evaluated to locate the epicenter of the earthquake in Exercise 1?

- ☐ 2
- ☒ 3 ✓
- ☐ 4
- ☐ 5

What process was used to determine the epicenter of the earthquake in Exercise 1?

- ☐ Focus location
- ☐ Localization
- ☒ Triangulation ✓

Areas with frequent earthquakes have a higher incidence of volcanic activity and tsunamis.

- ☒ True ✓
- ☐ False

When locating the epicenter of an earthquake, what is the first step performed?

- ☒ Determine the P-wave arrival time on the seismogram. ✓
- ☐ Draw a circle around the station using the distance as the radius.
- ☐ Determine the surface wave arrival time on the seismogram.
- ☐ Use the travel-time graph to determine the distance of the station from the epicenter.

Compression compacts a block of rocks and causes shortening of the crust at a ____ fault.

- ☐ normal
- ☒ reverse ✓
- ☐ strike-slip

The distance calculated using the travel-time graph is the diameter of the circle to be generated around a station.

- ☐ True
- ☒ False ✓

Extension Questions

Tsunamis are formed as a result of sudden displacement of a large volume of water by significant vertical motion of a fault at the bottom of a volume of water. Which faults are most likely to generate tsunamis? Why? (SAMPLE ANSWER BELOW)

Students should recognize that faults that move a body of rock up or down will generate tsunamis. Therefore, normal or reverse faults are the most likely to generate tsunamis.